UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 6391

CSAH NO. 33

OVER THE

MINNESOTA RIVER

DISTRICT 8 - LAC QUI PARLE COUNTY

PREPARED FOR THE

MINNESOTA DEPARTMENT OF TRANSPORTATION

BY

COLLINS ENGINEERS, INC.

JOB NO. 5221 (CEI 91)

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. 6391, Piers 1 through 11 (except the bay between Piers 8 and 11 due to adverse / extreme flow conditions through the dam that precluded inspection), were found to be generally in satisfactory condition below water with light to heavy scaling observed over the majority of the pier surfaces above and below water. The most significant deterioration was at the upstream noses of the piers and consisted of heavy scaling and spalling with exposed reinforcing steel. There were light to moderate accumulations of timber debris on the upstream channel bottom. The channel bottom along the upstream fascia appeared stable with no notable deficiencies and there was a concrete apron at the downstream spillway.

INSPECTION FINDINGS:

(A) There was moderate to heavy scaling (related to ice damage) throughout most of the pier faces from 8 feet above the waterline to approximately 5 feet below the waterline. The scaling displayed penetrations of up to 3 inches with, in some cases, exposed reinforcing steel that exhibited less than 10% section loss.

(B) Numerous spalls with exposed reinforcing steel that exhibited less than 10% section loss were observed at random locations on most of the piers.

(C) Timber debris was observed scattered on the upstream channel bottom with pieces of drift up to 1 foot in diameter.

RECOMMENDATIONS:

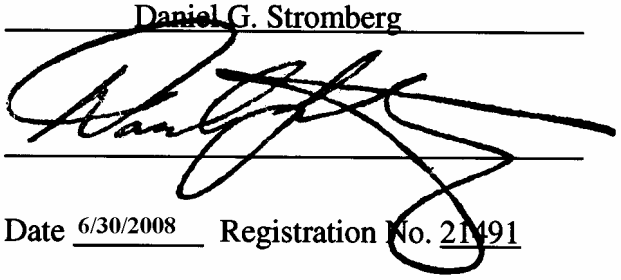
(A) To prevent further, more detrimental deformations repair all areas of spalling or heavy scaling with exposed reinforcing steel with a concrete grout mix for underwater applications designed to provide high durability and low permeability.

(B) Monitor the timber debris across the upstream fascia of the bridge, and if found to be increasing in the future, removal operations may become warranted.

(C) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

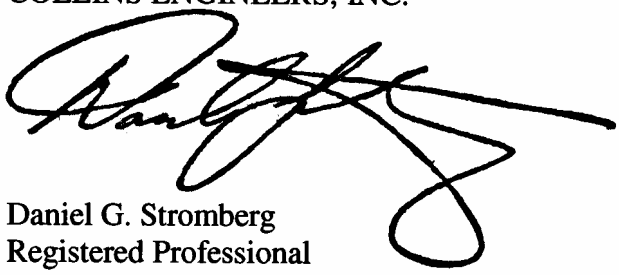
Daniel G. Stromberg



Date 6/30/2008 Registration No. 21491

Respectfully submitted,

COLLINS ENGINEERS, INC.



Daniel G. Stromberg
Registered Professional
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 6391

Feature Crossed: Minnesota River

Feature Carried: CSAH No. 33

Location: District 8 – Lac Qui Parle County

Bridge Description: Bridge No. 6391 was designed as an integral part of a dam. The bridge superstructure consists of twelve spans of six reinforced concrete beams supporting a reinforced concrete deck. The substructure consists of two reinforced concrete abutments and eleven reinforced concrete piers. The substructure units support both the bridge superstructure and the spillway gates. The piers are numbered 1 through 11 starting from the west end of the bridge. A concrete apron serves as a footing for the substructure units. The apron is founded on timber piles.

2. INSPECTION DATA

Professional Engineer/Team Leader: Daniel G. Stromberg, P.E., S.E.

Dive Team: Clayton G. Brookins, Valerie Roustan

Date: October 20, 2007

Weather Conditions: Sunny, 65°F

Underwater Visibility: 0.5 feet

Waterway Velocity: Negligible / None (upstream of dam)
Considerable downstream flow at open gates between Piers 8 through 11

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Piers 1 through 11 and the East and West Abutments. The bays between Piers 8 and 9 were not inspected due to adverse / extreme flow conditions through the dam.

General Shape: The pier shafts and abutments are rectangular reinforced walls with rounded noses upstream and squared ends downstream. A reinforced concrete apron founded on piles serves as a footing below all the substructure units.

Maximum Water Depth at Substructure Inspected: Approximately 15.2 feet.

4. WATERLINE DATUM

Water Level Reference: Corps of Engineers gauges at the site.

Water Surface: Upstream Pool Elevation = 934.4.
Downstream Pool Elevation = 924.0.

5. NBIS CODING INFORMATION (Minnesota specific codes are used for 92B and 113)

Item 60: Substructure: Code 6

Item 61: Channel and Channel Protection: Code 7

Item 92B: Underwater Inspection: Code B/10/07

Item 113: Scour Critical Bridges: Code J/95

Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site. _____ Yes X No

Photograph 1. Overall View of the Structure, Looking Southeast.

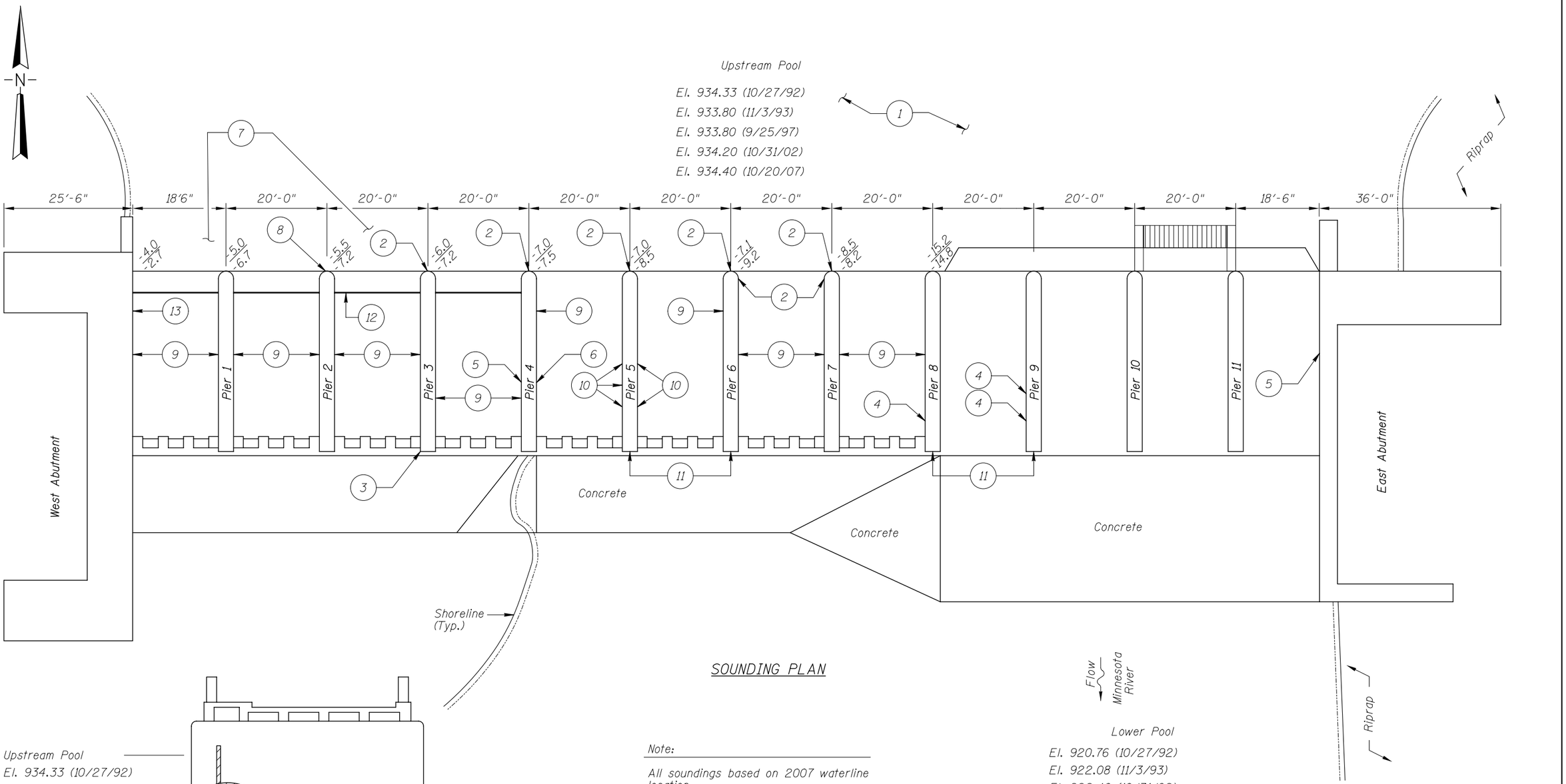
Photograph 2. View of the West Abutment Wall, Looking Northwest.

Photograph 3. View of the Upstream Nose of Pier 2, Looking Southwest. Note the Deteriorated Condition of the Concrete.

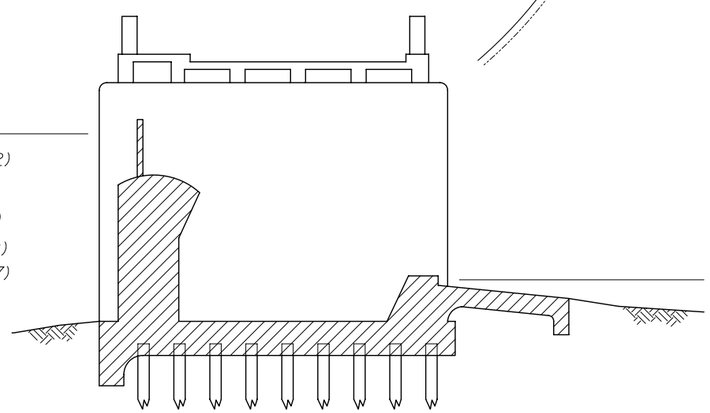
Photograph 4. View of the Downstream Nose of Pier 3, Looking Northeast.

Photograph 5. View of Pier 5, Looking Northeast.

Photograph 6. View of Piers 7 through 11, Looking Northeast.



SOUNDING PLAN



TYPICAL SECTION OF DAM & PIER
N.T.S.

Note:

All soundings based on 2007 waterline location.

Lower Pool
El. 920.76 (10/27/92)
El. 922.08 (11/3/93)
El. 922.40 (10/31/02)
El. 924.00 (10/20/07)

Legend

-3.0	Sounding Depth (10/20/07)
-3.0	Sounding Depth (10/31/02)

Note:

For Inspection Notes see Figure 2.

MINNESOTA
DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

STRUCTURE NO. 6391
OVER THE MINNESOTA RIVER
DISTRICT 8, LAC QUIPARLE COUNTY

INSPECTION AND SOUNDING PLAN

Drawn By: LJ	COLLINS ENGINEERS 123 North Wacker Drive Suite 300 Chicago, Il. 60606 (312) 704-9300 www.collinsengr.com	Date: OCT. 2007
Checked By: VR		Scale: NTS
Code: 52210091		Figure No.: 1

GENERAL NOTES:

1. Piers 1 through 11 (bays at Piers 8 through 11 could not be inspected due to extreme flows through gates) and the East and West Abutments were inspected underwater.

2. At the time of inspection on October 20, 2007, the waterline elevation at the upstream pool was 934.4 and the waterline elevation at the downstream pool was 924.0. Elevations were referenced from the Corps of Engineers gauges at the site.

3. Soundings indicate the water depth at the time of inspection and are measured in feet.

INSPECTION NOTES:

(1) The channel bottom material consisted of silt, sand, and cobbles with up to 6 inches of probe rod penetration.

(2) Moderate to heavy scaling from 3 feet above the waterline to 5 feet below the waterline around the upstream nose with a maximum penetration of 3 inches and exposed reinforcing steel (less than 10% loss on exposed reinforcing) on Piers 4 and 5. Deterioration typically had up to 2 inches of penetration.

(3) Spall located 6 inches above the concrete apron measuring 2 feet wide by 2 feet high with up to 3 inches of penetration and exposed reinforcing steel that exhibited less than 10% section loss.

(4) Spall located 7 to 10 feet above the waterline with up to 3 inches of penetration and exposed reinforcing steel that exhibited less than 10% section loss.

(5) A hairline vertical crack with efflorescence was observed extending from 8 feet above the waterline to the waterline. In addition, there were several small spalls around the crack typically 3 inches in diameter with exposed reinforcing steel that exhibited less than 10% section loss. (2002 note)

(6) A hairline horizontal crack was observed at 1 foot above the concrete apron.

(7) Timber debris was observed scattered on the channel bottom with pieces of drift up to 1 foot diameter.

(8) Spall located from 1 foot above the waterline to 1 foot above the channel bottom with up to 5 inches of penetration and exposed reinforcing steel that exhibited less than 10% section loss.

(9) Band of heavy scaling between 8 feet above the waterline and the waterline with typically up to 1/2 inch penetration and random areas of up to 1.5 inches of maximum penetration.

(10) Scaling from waterline to 6 feet above waterline with penetrations up to 2 inches with exposed reinforcing steel was observed. Exposed reinforcing typically had up to 10% section loss.

(11) Heavy scaling from 3 feet above to 3 feet below the waterline around the downstream nose with 3 inches of maximum penetration and exposed reinforcing steel that exhibited less than 10% section loss.

(12) Spall located 1.5 foot above to 2.5 feet below the waterline with up to 3 inches of penetration and exposed reinforcing steel that exhibited less than 10% section loss.

(13) Up to 1/16 inch vertical crack with oxidation and moisture from the apron slab extending upward.

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INSPECTION NOTES

Drawn By: LJ	COLLINS ENGINEERS, INC. 123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com	Date: OCT. 2007
Checked By: VR		Scale: N/A
Code: 52210091		Figure No.: 2

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES
DAILY DIVING REPORT

INSPECTORS: Collins Engineers, Inc. DATE: October 20, 2007

ON-SITE TEAM LEADER: Daniel G. Stromberg, P.E., S.E.

BRIDGE NO: 6391 WEATHER: Sunny, 65°F

WATERWAY CROSSED: Minnesota River

DIVING OPERATION: X SCUBA _____ SURFACE SUPPLIED AIR

_____ OTHER _____

PERSONNEL: Clayton G. Brookins, Valerie Roustan

EQUIPMENT: Scuba, Sounding Pole, Camera, Scraper, Camera

TIME IN WATER: 2:20 p.m.

TIME OUT OF WATER: 3:00 p.m.

WATERWAY DATA: VELOCITY Negligible/None (upstream) – extreme downstream at open gates

VISIBILITY 0.5 feet

DEPTH 15.2 feet maximum at Pier 9

ELEMENTS INSPECTED: Piers 1 through 11 and East and West Abutments

REMARKS: A dam is integral with the bridge. The bays between Piers 8 and 11 were not inspected due to very swift and heavy flow through the dam. The piers were generally in satisfactory condition with light to heavy scaling (related to ice damage) and random spalling over most of the pier surfaces above and below water. Several of the scaled or spalled areas exhibited exposed reinforcing steel. Moderate amounts of timber debris have accumulated on the upstream channel bottom.

FURTHER ACTION NEEDED: X YES _____ NO

Repair all areas of spalling or heavy scaling with exposed reinforcing steel with a concrete grout mix designed to provide high durability and low permeability.

Monitor the timber debris, and if found to be increasing in the future, removal operations may become warranted.

Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 6391
INSPECTORS Collins Engineers, Inc.
ON-SITE TEAM LEADER Daniel G. Stromberg, P.E., S.E.
WATERWAY CROSSED Minnesota River

INSPECTION DATE October 20, 2007

NOTE: USE ALL APPLICABLE CONDITION DEFINITIONS AS DEFINED IN THE MINNESOTA RECORDING AND CODING GUIDE INCLUDING GENERAL, SUBSTRUCTURE, CHANNEL AND PROTECTION, AND CULVERTS AND WALL DEFINITIONS TO COMPLETE THIS FORM.

CONDITION RATING

			SUBSTRUCTURE						CHANNEL					GENERAL					
UNIT REFERENCE NO.	UNIT DESCRIPTION	MAXIMUM DEPTH OF WATER	PILING	COLUMNS, SHAFTS, OR FACES*	FOOTINGS	DISPLACEMENT	OTHER	OVERALL SUBSTRUCTURE CONDITION CODE*	SCOUR	EMBANKMENT EROSION	EMBANKMENT PROTECTION	OTHER (DRIFT/DEBRIS)	OVERALL CHANNEL & PROTECTION CONDITION	CONCRETE	STEEL	TIMBER	LOSS OF SECTION	PREVIOUS REPAIR OR MAINTENANCE	OTHER
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	West Abutment	4.0’	N	6	N	9	N	6	8	N	N	6	7	6	N	N	N	N	N
	Pier 1	5.0’	N	6	N	9	N	6	8	N	N	6	7	6	N	N	N	N	N
	Pier 2	5.5’	N	6	N	9	N	6	8	N	N	6	7	6	N	N	N	N	N
	Pier 3	6.0’	N	6	N	9	N	6	8	N	N	6	7	6	N	N	N	N	N
	Pier 4	7.0’	N	6	N	9	N	6	8	N	N	6	7	6	N	N	N	N	N
	Pier 5	7.0’	N	6	N	9	N	6	8	N	N	6	7	6	N	N	N	N	N
	Pier 6	7.1’	N	6	N	9	N	6	8	N	N	6	7	6	N	N	N	N	N

*UNDERWATER PORTION ONLY

REMARKS: A dam is integral with the bridge. The bays between Piers 8 and 11 were not inspected due to very swift and heavy flow through the dam. The piers were generally in satisfactory condition with light to heavy scaling (related to ice damage) and random spalling over most of the pier surfaces above and below water. Several of the scaled or spalled areas exhibited exposed reinforcing steel. Moderate amounts of timber debris have accumulated on the upstream channel bottom.

NOTES: ATTACH SKETCHES AS NEEDED, IDENTIFY REMARK BY REFERRING TO UNIT REFERENCE NO. AND REMARK NO.
USE GENERAL SECTION TO IDENTIFY OVERALL PRESENCE OF SPALLS, CRACKS, CORROSION, ETC.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 6391
INSPECTORS Collins Engineers, Inc.
ON-SITE TEAM LEADER Daniel G. Stromberg, P.E., S.E.
WATERWAY CROSSED Minnesota River

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		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Pier 7	8.5’	N	6	N	9	N	6	8	N	N	N	8	6	N	N	N	N	N
	Pier 8	15.2’	N	6	N	9	N	6	8	N	N	N	8	6	N	N	N	N	N
	Pier 9	-	N	6	N	9	N	6	8	N	N	N	8	6	N	N	N	N	N
	Pier 10	-	N	6	N	9	N	6	8	N	N	N	8	6	N	N	N	N	N
	Pier 11	-	N	6	N	9	N	6	8	N	N	N	8	6	N	N	N	N	N

*UNDERWATER PORTION ONLY

REMARKS: A dam is integral with the bridge. The bays between Piers 8 and 11 were not inspected due to very swift and heavy flow through the dam. The piers were generally in satisfactory condition with light to heavy scaling (related to ice damage) and random spalling over most of the pier surfaces above and below water. Several of the scaled or spalled areas exhibited exposed reinforcing steel. Moderate amounts of timber debris have accumulated on the upstream channel bottom.

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